

# Co-Morbidity and CRPS: Implications for Treatment

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# Broad Question

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- What is the role of psychological, behavioral, and social factors in conceptualizing and treating CRPS?

# Impact on Life Function

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- CRPS associated with:
  - Work disability and change in occupation
    - Geertzen et al (1998); Kemler & Furnee (2002)
  - Impaired use of affected extremity affecting ADLs
    - Geertzen et al. (1998); Kemler & de Vet (2000)
  - Reduced ROM and muscle strength
    - Geertzen et al. (1998)
  - Poor sleep and reduced energy
    - Kemler & de Vet (2000)

# Conceptualizing CRPS

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- CRPS is a biopsychosocial and behavioral disorder
- Such disorders are amenable to cognitive/behavioral treatment approaches

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**Psychological Factors:  
Contributors to Onset or  
Maintenance of CRPS?**

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# Theorized Psychophysiological Links

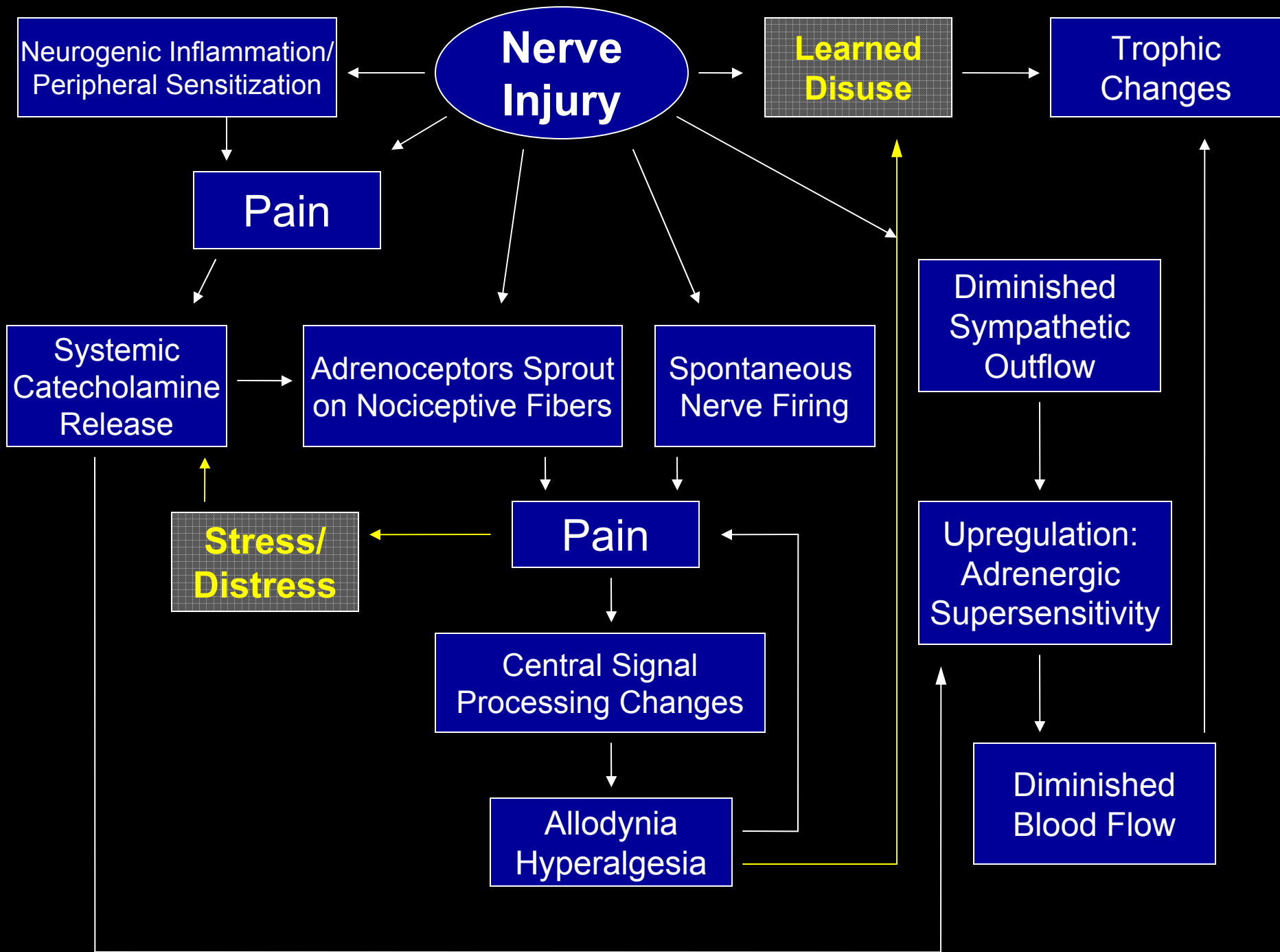
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- CRPS is unique: significant autonomic component
- Nociceptive and non-nociceptive afferent fibers develop sensitivity to adrenergic activation
- Upregulation of peripheral adrenergic receptors

From: Bruehl (2001)

# Pathophysiology of CRPS

- *Diminished* peripheral sympathetic nervous system function differentiates patients developing CRPS following fracture from those not developing CRPS
  - Schurmann et al. (1999; 2000)
  - Birklein et al. (2001)
- Plasma catecholamine levels *lower* in affected limb of established CRPS patients than unaffected limb
  - Harden et al. (1994)
- Autonomic signs of CRPS due to upregulation of peripheral catecholamine receptors
  - Arnold et al. (1993)



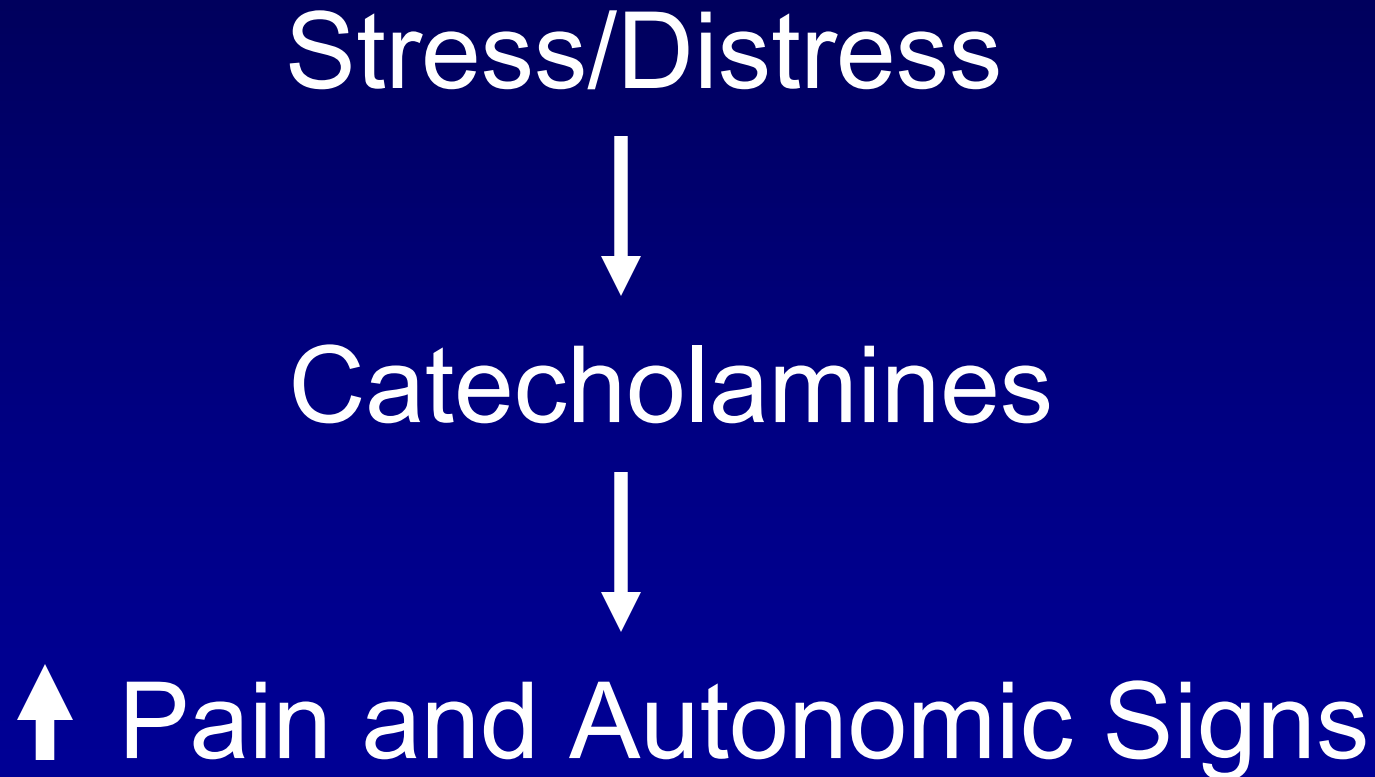
# Theorized Psychophysiological Links

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- Psychological factors affecting catecholamine release may directly affect pain and vasomotor aspects of CRPS
  - Life Stress
  - Anxiety
  - Anger
  - Depression
- Any factor that contributes to elevated pain helps maintain central signal processing changes

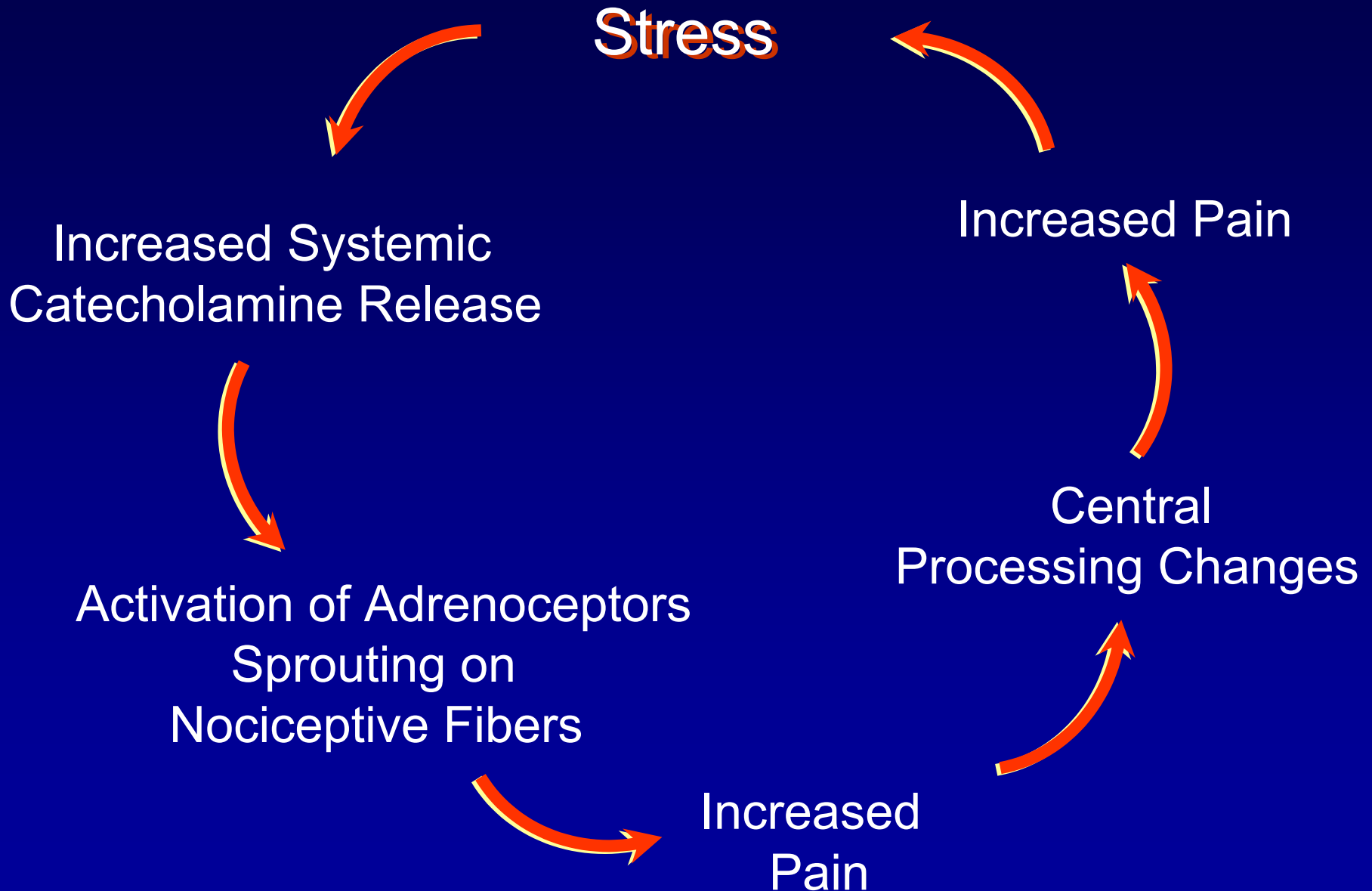
# Theorized Psychophysiological Links

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From: Bruehl (2001)

# Vicious Cycle of Arousal?



# Vicious Cycle of Disuse?

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- Disuse as learned response to avoid pain and allodynia
- Eliminates normal proprioceptive input and prevents desensitization
- Eliminates “muscular pump” --> may allow sensitizing neurotransmitters to accumulate
- Guarding contributes to myofascial pain
- Maintains pain and pathological central processing changes

# Alternative Models

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- Psychological factors could contribute to onset of CRPS in conjunction with pathophysiological mechanisms above
- CRPS pain *once developed* may be more sensitive to psychological factors than non-CRPS pain

From: Bruehl (2001)

# Psych Factors as Causal

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- Prospective studies necessary to prove that psychological factors contribute to onset of CRPS

# Prospective Psych Predictors?

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- 77 patients undergoing TKA assessed pre-op and 1-, 3-, and 6-month followup
- Completed MPQ, STAI, BDI, and CRPS evaluation at each visit

From: Harden, Bruehl, et al. (2003)

# Prospective Psych Predictors?

- Preoperative anxiety and depression predicted development of CRPS-like phenomena at one-month post-TKA
- Anxiety: 29% above median vs. 10% below median displayed “CRPS”
  - Sensitivity = .73      Specificity = .56

From: Harden, Bruehl, et al. (2003)

# Prospective Psych Predictors?

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- Depression and anxiety not predictors of CRPS at 3- and 6-month followup
- Clinical utility doubtful

From: Harden, Bruehl, et al. (2003)

# Are CRPS Patients Unique?

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- If psychological factors are causal in CRPS, might expect CRPS patients as a group to be psychologically different than non-CRPS chronic pain patients

# Psychological Comparisons: CRPS to Non-CRPS Pain

- Support for Psychological Differences:
  - More frequent retrospective recall of major life stressors surrounding CRPS onset
    - Geertzen et al. (1998)
  - Greater emotional distress in CRPS
    - Bruehl et al. (1996)
    - Geertzen et al. (1994)
    - Hardy & Merritt (1988)
    - Ciccone et al. (1997)

# Psychological Comparisons: CRPS to Non-CRPS Pain

- Lack of Psychological Differences:
  - No differences in distress between CRPS, low back pain, or headache patients
    - Haddox et al. (1988)
    - DeGood et al. (1993)
  - No differences in rates of psychiatric diagnosis between CRPS and non-CRPS chronic pain
    - Monti et al. (1998)

# Psychological Comparisons: CRPS to Non-CRPS Pain

- CRPS Natural History: Mixed Support
  - Prospective Study in TKA Patients
    - Harden, Bruehl et al. (2003)
  - CRPS patients more depressed at one-month post-TKA and more anxious at six-months post TKA than those with ongoing non-CRPS pain
  - No differences at other time periods

# Psychological Factors Exacerbate CRPS Pain

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- Psychological factors clearly affect intensity of CRPS pain once developed
- Consistent with findings in non-CRPS chronic pain

# Psychological Factors Exacerbate CRPS Pain

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- Daily depressed mood reliably predicts CRPS pain intensity on following day
  - Feldman et al. (1999)

# Psychological Factors Exacerbate CRPS Pain

- Stronger correlations between distress and pain intensity in CRPS
- Phobic anxiety
  - CRPS:  $r = 0.61$       LBP:  $r = 0.29$
- Depression
  - CRPS:  $r = 0.60$       LBP:  $r = 0.42$

From: Bruehl et al. (1996)

# Psychological Factors Exacerbate CRPS Pain

- Stronger correlations between emotional regulation style and pain intensity in CRPS
- Anger-Out (expressive)
  - CRPS:  $r = 0.38$       LBP:  $r = -0.15$

From: Bruehl et al. (2003)

# Psychological Issues in CRPS

- Conclusions (my opinion)
  - Psych factors not strongly involved in CRPS onset
  - No consistent psychological differences between CRPS and non-CRPS chronic pain patients
    - Previously findings may be due to sample selection effects
  - Psychological factors may have unique impact on CRPS pain intensity
    - Consistent with theoretical mechanisms

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# Psychological Factors and Disuse

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# Disuse in CRPS Pathophysiology

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- *Preliminary* support for disuse contributing to development of CRPS
- Healthy normals develop hyperesthesia and temperature changes after prolonged casting

From: Butler et al. (1999)

# Worrying about Pain

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- Chronic pain is associated with:
  - *“chronic vigilance to threat that may lead to a perseveration of attempts at solving the problem of achieving escape from pain. Attempts will be frustrated by the insolubility of the problem of chronic pain.”*  
(Aldrich et al., 2000)

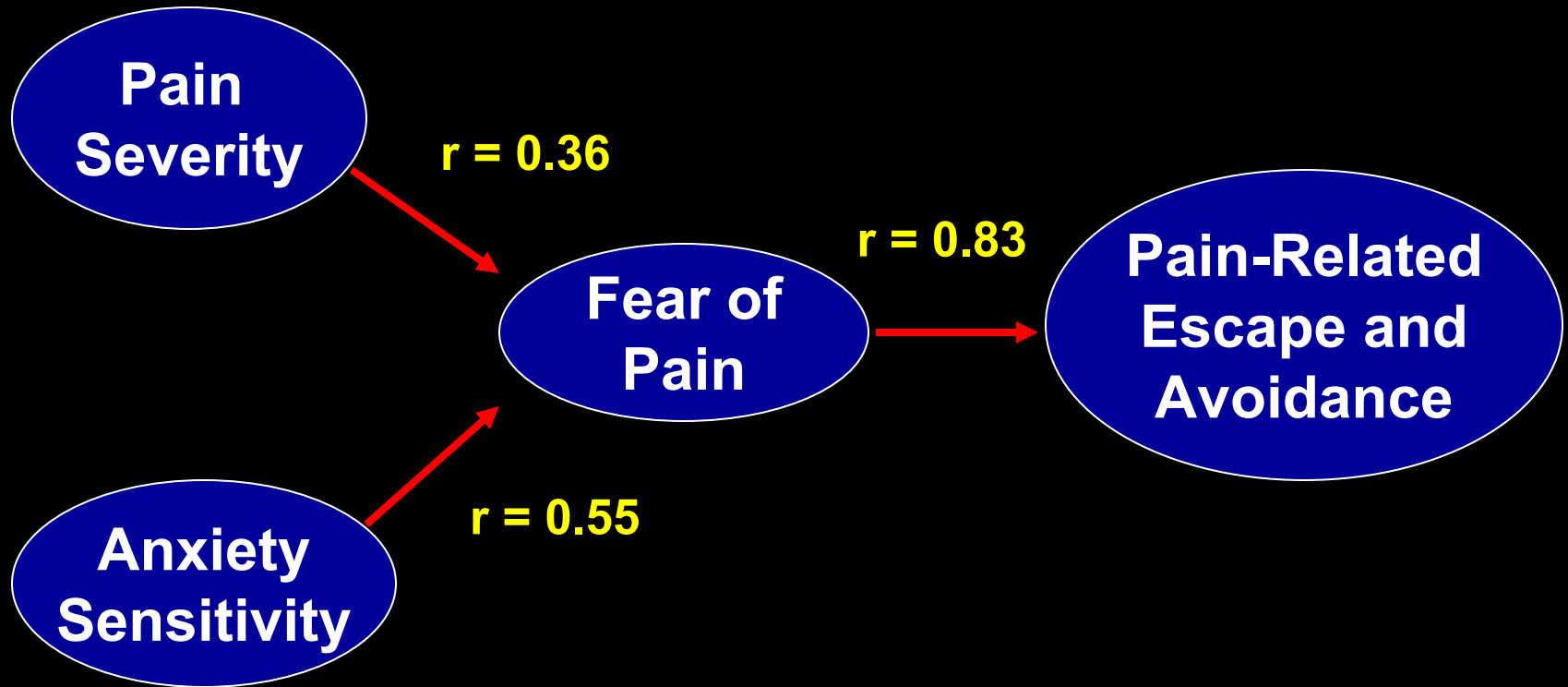
# Fear of Pain

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- Fear of pain more disabling than pain itself
- Disability predicted better by Tampa Scale of Kinesiophobia and Fear-Avoidance Beliefs Questionnaire than pain intensity

From: Crombez et al. (1999)

# Fear of Pain



From: Asmundson & Taylor (1996)

# Fear of Pain

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- Same fear of pain issues are likely to apply in CRPS
- May be more severe due to “mysterious” nature of CRPS and impact of local allodynia/hyperalgesia



# AGONY

NOT ALL PAIN IS GAIN.

# Reasons for CRPS-Related Disuse

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- Pain-related anxiety and fear of movement
- Operant learning (+/- reinforcement)
- Neglect-like phenomena (cause?)

# Role of Operant Learning

- Specific Activity → Pain
- Avoid specific activity → Avoid Pain
- Pain avoidance (and related anxiety decrease) reinforces avoidance of specific activity
- Activity avoidance generalizes to other activities
- Can result in significant disability

# Family as Operant Reinforcers

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- Family members can also influence disuse and activity avoidance
  - Solicitous responses
    - “You poor thing – I’ll do it for you”
    - “Don’t do that – you’ll hurt yourself”
- These responses encourage passivity and activity avoidance which become habitual

# Role of Operant Learning

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- Learned disuse may be reinforced by:
  - a) Actual pain avoidance
  - b) Responses of others
  - c) Diminished anxiety due to avoiding feared pain exacerbations
- Once learned disuse develops, it may continue even after underlying pain pathophysiology improves (due to c above)

# Learned Disuse and CRPS Pathophysiology

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- Learned disuse could contribute to:
  - Failure to desensitize affected extremity
  - Excessive local buildup of algogenic substances through impaired muscular pumping

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# CRPS Therapy Issues

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# CRPS Therapy

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- Consensus treatment recommendations by expert panels emphasize functional restoration as the cornerstone of CRPS treatment
  - Stanton-Hicks et al. (1998; 2002)

# CRPS Therapy

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- Targeting learned disuse and stress/distress may help break vicious cycles helping to maintain CRPS
- Providing pain coping skills improves functioning and quality of life

# Multidisciplinary Intervention is Key!!

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- Medications are palliative, but may help break vicious cycles
- Blocks are not curative, but may be palliative
- Invasive interventions (SCS) are palliative
- Proper PT and OT is crucial for progress
- Psychological therapy:
  - Reinforces other disciplines
  - Addresses treatment barriers
  - Increases perceived control over condition

# Perceived Control !!

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- Increasing patients' sense of control over CRPS is crucial to addressing hypervigilance and pain-focused fears.

# “Life as Therapy”

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- Daily life should be reconceptualized for patients as crucial 24-hour PT/OT
  - Work activities, home activities, self-care, recreation
- Treatment focused in part on removing psychological barriers to reactivation

# Psychological Treatments

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- Controlled studies extremely limited
- Case reports/case series support several psychological treatments:
  - Autogenics
    - Kawano et al. (1989)
  - Biofeedback
    - Alioto (1981); Blanchard (1979); Barowsky et al. (1987)
  - Hypnosis/Imagery
    - Gainer (1992)

# Psychological Treatments

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- Only one randomized controlled trial:
  - PT+autogenics produced greater improvement in limb temperature than PT alone (both groups reported decreased pain)

From: Fialka et al. (1996)

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# Treatment Recommendations

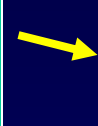
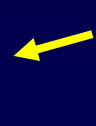
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All Patients



Patient/Family Education  
\*CRPS Pathophysiology  
\*Influence of Psych  
\*Self-Management Focus  
\*Disuse Issues

“Acute” CRPS  
(<6-8 weeks)



“Chronic” CRPS  
(>6-8 weeks)



Monitor for Progress  
in PT/OT and MD



No  
Progress



Psychological Evaluation:  
\*Axis I Disorders  
\*Cogn/Behav/Emotional Response  
\*Major Stressors  
\*Family Responses



Pain Management Treatment:  
\*Monitored Relaxation/Biofeedback  
\*Cognitive Coping (catastrophize)  
\*Behavioral Intervention:  
-Avoid Avoidance  
-Reinforcing Activity  
-Family Reinforcement

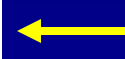


General CBT for Identified Issues

Progress



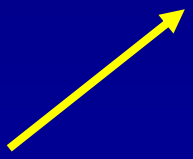
*Discharge*



Progress



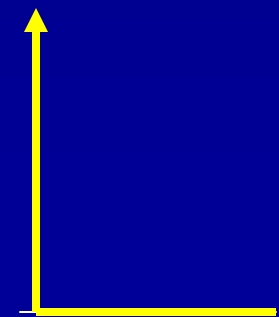
No Progress



No Progress OR Axis I/Stressor Present



Progress



# Family Therapy

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- Educate patient and family regarding nature and treatment of CRPS
  - Emphasize reactivation crucial despite pain
  - Pain does not signal damage
  - Appropriate pacing
    - Be active, but avoid severe flare-ups

# Family Therapy

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- Managing Operant Issues:
  - Avoid excessively solicitous responses
    - Is natural caretaker response
    - Avoid unintentionally encouraging disability and unnecessary activity limitations
  - Encourage distraction
    - Suggest joint activities
  - Reinforce appropriate activity and use of pain coping skills

# Social Support

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- Positive social support is directly related to subsequent improved mood
- Social support buffers the impact of negative mood on pain
  - Feldman et al. (1999)

# Biofeedback/Relaxation Skills

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- 8-12 sessions of relaxation training
  - Combine in session training with intensive home practice
  - Includes:
    - Muscle relaxation
    - Autogenics (self-suggestion)
    - Breathing relaxation
    - Imagery (for relaxation and pain control)
  - Learning may be most effective if combined with EMG and/or temperature biofeedback

# Biofeedback/Relaxation Skills

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- Progressive muscle relaxation particularly good for myofascial issues (may reverse “spreading”)
  - EMG biofeedback may be good adjunct to muscle focused relaxation
- Thermal biofeedback a good adjunct to all such techniques
  - Initially should target unaffected extremity

# Biofeedback/Relaxation Skills

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- Home practice and generalization are critical
- Use home relaxation monitoring logs
- Once techniques are mastered, reframe exacerbated pain as relaxation cue
  - Increases perceived control !!
- Coordinate with PT/OT to reinforce use of relaxation skills during therapy sessions

# Cognitive Coping Skills

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- Goal is to retrain CRPS patients to identify automatic maladaptive cognitions and replace them consciously with more adaptive cognitions
- *Crucial* to help patients adopt a self-management focus (internal control) rather than “procedure as cure” focus (external control)

# Cognitive Coping Skills

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- Maladaptive Cognitions:
  - Increase distress and pain
  - Serve as barrier to improved function
- Common Maladaptive Cognitions:
  - “This is awful”
  - “I can’t handle this pain anymore”
  - “My life is over - I give up”
  - “I cant’ do that – it will make my pain worse”
  - “This is only going to get worse”

# Cognitive Coping Skills

- Emphasize Constructive Cognitions:
  - Increase *sense of control* over condition
  - Decreases distress and pain
  - Encourages improved function
- Examples:
  - “When it hurts, I will use my relaxation skills”
  - “Staying active is the way to get better”
  - “I refuse to let this stop me from living”
  - “Things could be a lot worse”

# Behavioral Treatments

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- Graded activity increases
  - Balance: Increased activity vs. severe flare-ups
- Experiments to test whether activity barriers are absolute or learned
  - Although physical capabilities may change as functional treatment progresses, learned barriers do not necessarily disappear
- Integrating biofeedback/relaxation skills with daily activities

# Multidisciplinary Treatment

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- Meta-analyses indicate multidisciplinary treatment works for chronic pain, and CRPS is likely to be no exception
  - Flor et al. (1992)
  - Morley et al. (1999)

# Multidisciplinary Treatment

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- Important to integrate psych/behavioral treatments with other therapies
  - Work closely with PT/OT to:
    - Develop appropriate activity guidelines
    - Address maladaptive cognitions and learned disuse that may be barriers to functional therapies
  - Work closely with MD to:
    - Insure treatment expectations are realistic
    - Maintain self-management focus

# Conclusions

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- CRPS is a biopsychosocial and behavioral disorder
- Psychological factors are not likely causative
  - Exception: learned disuse?
- Psychological and behavioral factors do impact on CRPS pain and function
- Successful treatment requires addressing biopsychosocial and behavioral issues